

Fire Protection Engineer, Step 1

New Hires are placed at step one until they meet the minimum requirements and qualifications to move to step two.

To move to step two, a Fire Protection Engineer at step one must obtain the following credentials as mandated by the State of Wisconsin, International Code Council, and additional education. A Fire Protection Engineer must possess:

- 1. A Bachelor's Degree in Fire Protection Engineering or a closely related field from an accredited college or university.**
- 2. State of Wisconsin Commercial Building Inspectors License**
- 3. ICC – Fire Plans Examiner**
- 4. NFPA Fire Protection Plans Examiner 1 or Certified Fire Plans Specialist**

An Fire Protection Engineer holding these credentials upon entering the City of Milwaukee Construction Trades Division, with supervisor and DNS administrative approval, may be eligible for appointment to a higher career ladder step (based on certifications held at the time of appointment) with the one year probationary period waived for the sole purposes of this Career Ladder. Separate probationary period requirements mandated by the Department of Employee Relations still apply.

Secondly, a Fire Protection Engineer must demonstrate a thorough knowledge pertaining to the fundamentals of performing basic Fire Plan Reviews as they relate to good communication, construction methodologies, code knowledge, problem solving and code interpretation and its enforcement. Listed below is a representation of the core competencies that a Fire Protection Engineer must have a thorough knowledge of:

General Competencies

- Customer Communication Skills
- Management and Control of Assigned Fire Protection Plan Assignments.
- Ability to coordinate with other DNS and City Entities
- Ability to Evaluate and Interpret Plans
- Thorough knowledge of the Milwaukee Code of Ordinances
- Code Administration and Definitions of Commercial and 1&2 Family Construction Codes
- Familiarity of DNS processes and skill set with regards to computer programs.

Commercial Code Competencies

- Use and Occupancy Classifications
- Special Use Occupancies and Elements
- Height and Area Limitations Based on Type of Construction
- Fire Resistance and Protection Requirements
- Interior Finishes
- Use and Application of Glass, Glazing, Safety Glazing & Plastics
- Means of Egress
- Accessibility
- Building Systems Such as Lighting, HVAC, Plumbing Fixtures, Elevators, Generators
- Structural Components Such as Masonry, Wood, Steel and their Performance and Stability
- Safeguards During Construction

- Erosion Control and Storm Water Management Regulations
- Special Construction Such as Membrane Structures, Tents & Awnings
- Hazardous Occupancies
- Use & Application of the International Existing Building Code
- Use & Application of the International Fuel Gas Code
- Use & Application of the International Mechanical Code
- Use & Application of the International Energy Conservation Code
- Use & Application of ANSI A117.1 Standard for Accessible and Usable Buildings and Facilities
- Competency of Code Referenced Standards
- General Knowledge of the Milwaukee Code of Ordinances
- Familiarity and Application of the International Fire Code

ICC - Fire Plans Examiner - Core Competencies

Occupancy Types

- Types Of Occupancy
- Specific Hazards Associated With Use
- Evaluation Of Special Fire Protection Features
- Occupant Load

Hazardous Materials

- Management Plan
- Inventory Statements
- Fire Prevention Control
- Mitigation Of Dangerous Conditions
- Material Safety Data Sheets
- Control Areas
- Special Hazards
- Storage Of Combustibles
- Flammable And Combustible Liquids And Gasses

- Storage Of Combustibles

Fire Protection

- Water Supply For Fire Protection
- Sprinkler, Standpipes, And Alternate Automatic Fire Extinguishing Systems
- Fire Alarm And Detection Systems
- Portable Extinguishers
- Smoke Control Systems

Egress Safety

- Emergency And Standby Power
- Egress Doors
- Stairs, Ramps, And Balconies
- Exit Access
- Access To Buildings, Windows And Roofs
- Hazards To Fire Fighters

NFPA – Certified Fire Plans Examiner 1 / Certified Fire Plans

Specialst

- NFPA 1, Fire Code – 2009 or 2012 Editions
- NFPA 13, Standard for the Installation of Sprinkler Systems – 2007 or 2010 Editions
- NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems – 2008 or 2011 Editions
- NFPA 72, National Fire Alarm Code® - 2007 or 2010 Editions
- NFPA 101, Life Safety Code® - 2009 or 2012 Editions Roofs

Additionally, a Fire Protection Engineer must also meet or exceed the thresholds for advancement established in the **QUANTITATIVE CORE COMPETENCIES**. This separate quantitative core competencies packet for this position is subject to review by the department supervisor for applicability with regards to the time frame analyzed while taking into consideration applicable training, specialty projects, inspector workload, district composition, and other factors that may have in impact on performance.

Fire Protection Engineer, Step 2

To move to step two, a Fire Protection Engineer at step one must obtain one of the following credentials issued by The National Institute for Certification in Engineering Technology (NICET):

1. NICET – Level 1 for Fire Alarm Systems

OR

2. NICET – Level 1 for Water Based Fire Protection Systems Layout

A Fire Protection Engineer at step two must demonstrate a thorough knowledge pertaining to the fundamentals of performing basic and advanced technical aspects for review of sprinkler and fire alarm reviews as well as begin to while maintaining qualitative core competencies of a Fire Protection Engineer at step two.

These certifications requirements are intended to represent a mastery in a particular subject that will continue to be built upon in the coming career ladder steps.

Listed below is a representation of the core competencies that a Fire Protection Engineer must have a thorough knowledge of to advance to a step two:

NICET – Level 1 for Fire Alarm Systems

- Properly mount and connect fire alarm system components.
- Representation of system components, cabling, and dimensions on system drawings
- Terminology related to basic components and installation operations
- Roles of codes and standards in fire alarm systems work
- Scopes of the IBC, IFC, and IRC
- Scopes of NFPA 1 and 101 codes
- Scopes of NFPA 70 and 72 standards
- Types of fire alarm systems and associated devices
- Tools required for mounting and connecting fire alarm system components, and their operation
- Materials required for mounting cables and devices
- Functions performed in a fire alarm system by manual fire alarm boxes, automatic fire detection devices, audible signaling appliances, visible signaling appliances, and annunciators; and how they are operated
- Communicate with other team members about the installation process.
- Recognize the on-site hierarchy of authority.
- Properly use hand and power tools to mount and connect fire alarm system components.
- Apply proper installation techniques under supervision.
- Use project plans and specifications to determine dimensions, type of materials, elevations, and locations.
- Mount and fasten field devices, sensors, and video cameras; and connect power and signaling wiring.
- Assist with acceptance testing by activating initiating and notification devices or visually identifying remote annunciation of devices.
- 1.1.2 Practice correct wiring methods. Knowledge:
- Representation of system components, cabling, and dimensions on system drawings
- Tools required for mounting cables, wires, conduit, and fixtures, and their operation

- Types of outlet and junction boxes and their applications
- Types of wire and cable, and their applications
- Types of conduit and their applications
- Materials required for mounting cables Skills:
- Use project plans and specifications to determine dimensions, type of materials, elevations, and locations.
- Properly use hand and power tools to mount cables, wires, conduit, fixtures, and supports.
- Apply proper installation techniques under supervision.
- Feed cables through access holes, roof spaces, and cavity walls to reach fixture outlets.
- Position and terminate cables, wires, and strapping.

NICET – Level 1 for Water Based Fire Protection Systems Layout

- Knowledge: NFPA 25:3.5 and 3.6
Function and purpose of differential dry pipe valves in a system Visual characteristics/appearance of each of the types of components of a sprinkler system Visual characteristics/appearance of each of the types of components of a standpipe system Skills: Identify various types of valves an Knowledge:
- NFPA 25:3.5 and 3.6
- Function and purpose of differential dry pipe valves in a system
- Visual characteristics/appearance of each of the types of components of a sprinkler system
- Visual characteristics/appearance of each of the types of components of a standpipe system
- Identify various types of valves and their roles in a system.
- Identify types of fire pumps.
- Identify system risers, mains, branch lines, and all other system components.
- Identify sprinkler heads, but not types of sprinklers.
- Locate and read gauges.
- Visually inspect for external damage and visually apparent operational deficiencies, wet and dry pipe system components (except for sprinklers), including gauges, control valves, pipe and fittings, alarm devices, hangers and braces, fire department connections, backflow assemblies, wet alarm valves, dry pipe valves, check valves, quick-opening devices (QODs), and main drains.
- NFPA 25: 5.2 (except sprinklers)
- External characteristics of various components of wet and dry pipe sprinkler systems
- External indicators of damage or deficiency
- Units of pressure
- Use NFPA 25: Table 5.1.1.2 to determine inspection frequencies.
- Read pressure gauges on risers and note whether readings are within the expected range.
- Check gauges for damage.
- Visually inspect pipes and fittings for leaks or damage.
- Visually inspect sprinklers for obvious physical damage.
- Identify alarm devices, and verify that they are connected.
- Visually inspect hangers and braces for damage or deficiencies.
- Visually inspect fire department connections for damage or deficiencies.

- Perform a visual external inspection of backflow assemblies for damage or deficiencies.
- Perform a visual external inspection of wet alarm valves, dry pipe valves, and check valves for damage or deficiencies.
- Perform a visual external inspection of quick opening devices for damage or deficiencies.

Additionally, a Fire Protection Engineer advancing from step one to step two must also meet or exceed the thresholds for advancement established in the QUANTITATIVE CORE COMPETENCIES.

Fire Protection Engineer, Step 3

To move to step three, a Fire Protection Engineer at step two must obtain the following credentials issued by the National Institute for Certification in Engineering Technology (NICET):

1. **NICET – Level 1 for Fire Alarm Systems**
- AND**
2. **NICET – Level 1 for Water Based Fire Protection Systems Layout**

Secondly, a Fire Protection Engineer at step three must demonstrate a thorough knowledge pertaining to the fundamentals of performing basic and advanced technical aspects for review of sprinkler and fire alarm reviews as well as begin to while maintaining qualitative core competencies of a Fire Protection Engineer at step three.

It is at this point that the Fire Protection Engineer gains a great deal of mastery on the technical aspects with recognition of performance of fire plan reviews, inspections, and fire alarm reviews on a structure. It is not the intent of this step to force a retake of the examinations or certifications that were possessed in the earlier step, but rather that the candidate have successfully taken and passed both levels of NICET Level 1.

Additionally, a Fire Protection Engineer advancing from step two to step three must also meet or exceed the thresholds for advancement established in the QUANTITATIVE CORE COMPETENCIES.

Fire Protection Engineer, Step 4

To move to step four, a Fire Protection Engineer at step three must obtain one of the following credentials issued by National Institute for Certification in Engineering Technology (NICET):

1. **NICET – Level 2 for Fire Alarm Systems**
- OR**
2. **NICET – Level 2 for Water Based Fire Protection Systems Layout**

Secondly, a Fire Protection Engineer at step four must demonstrate a thorough and expansive knowledge pertaining to the fundamentals of water based fire suppression systems and fire alarm systems. Listed below is a representation of the core competencies that a Fire Protection Engineer must have a thorough knowledge of to advance to a step four:

NICET – Level 2 for Fire Alarm Systems

- Verify the occupancy classification and the requirements of applicable codes and standards for specified premises.
 - IBC, IFC, and IRC
 - NFPA 1 and 101
 - Read and interpret commonly referenced code requirements.
 - Identify code requirements that apply to specified occupancies.
 - Verify that general site conditions are consistent with occupancy classifications designated by others.
 - Communicate findings to project supervisor.
 - Assemble project information for shop drawings.
 - Elements of a shop drawing
 - Types of information found on fire protection, architectural, mechanical, electrical, structural, and site plans
 - Types of performance information found in contractual documents, including cutting and patching, site access, parking and test requirements, etc.
 - Types of information found in project specifications
 - Read and interpret project specifications.
 - Determine the scope of the project.
 - Read and interpret drawings with basic information about the facility, the proposed fire alarm system, and other building systems.
 - Derive facility and building system information from architectural, mechanical, electrical, structural, and site plans.
 - Survey site conditions to verify that they support the requirements of the fire alarm system design and layout.
 - IBC, IFC, IRC, and NFPA 101
 - NFPA 70 and 72
 - Building features and construction materials
 - Basic terminology of codes and standards
 - Building construction and design (e.g. risers, electrical closets, etc.)
 - Measure lengths, heights, and ceiling pitch.
 - Verify floor plans and collect information about building features, dimensions, and materials as relevant to a fire alarm system project.
 - Verify that room identification and apparent use is consistent with floor plans.
 - Record building features and details that must be considered in designing and installing a system to meet applicable standards.
 - Inspect installation sites and study work orders, building plans, and installation manuals in order to determine materials requirements and installation procedures.
- 2.1.5 Draft simple shop drawings.
- Knowledge:
- IBC, IFC, IRC, and NFPA 1 and 101
 - NFPA 70, 72, 170, and applications of other NFPA standards
 - Types of information found on architectural, fire protection, mechanical, electrical, structural, site plans, and related design drawings
 - Types of information found in project specifications
 - Use of architectural scales in preparation and reading of drawings
 - Types of information presented in a shop drawing
 - Use computerized drafting tools.
 - Draft a correctly oriented, scaled, lined, and dimensioned layout drawing with correct symbols, legend, and title block.
 - Prepare basic fire alarm systems layouts in accordance with standards.
 - Calculate the number and spacing of fire detection devices and notification appliances required for a given space.
 - Prepare materials lists from project specifications.
 - Deliver prepared drawings to supervisor for approval.
 - Determine power supply and loading requirements for fire alarm systems.
 - NFPA 70 and 72
 - Basic electrical circuits

- Basic mathematics
- Types of information found in project specifications
- Determine the requirements of NFPA 72 for primary and secondary power for various types of fire alarm systems.
- Read and interpret manufacturers' published instructions.
- Read and interpret electrical plans and related design drawings
- Perform battery standby calculations.
- Perform voltage drop calculations.
- Perform circuit loading calculations.
- Confirm that power supply for the proposed layout and any related existing conditions comply with codes, standards, project specifications, and manufacturers' requirements.
- Determine the minimum wire size and maximum distance for the application.
- 2.1.7 Identify applicable codes, standards, and listings.
- Purposes and applications of the IBC, IFC, and IRC, and NFPA 1, 70, 72, 101, and 170
- Roles of authorities having jurisdiction and industry professions in enforcing codes and standards
- Purposes and applications of NRTLs (Nationally Recognized Testing Laboratories) and associated standards
- Methods for review and testing of fire alarm signaling equipment
- Identify the common codes and standards that address specific project activities or scopes of work.
- Identify and interpret the principles and requirements of standards for system alarm initiating devices, system control functions, and fire suppression systems.
- Identify requirements and listings for various system components.
- Read fire alarm and other building system plans.
- Construction symbols and terminology
- Elements of shop drawings
- Information contained in architectural, fire protection, mechanical, electrical, and structural site plans, and related design drawings and specifications
- Review various plans (fire alarm and other trades) that may impact the fire alarm system installation to identify any changes, modifications, special conditions, or requirements that affect the project.
- Recognize the full scope of work at the site, and its impact on the fire alarm project.
- Identify all types of new and existing fire alarm equipment and initiating devices shown on plans.
- Identify the equipment installed by construction industry trades, such as architectural, mechanical, electrical, and structural, and its impact on fire alarm system installation.
- Determine the locations of structural obstructions and mechanical systems shown on plans.
- Install fire alarm systems.
- NFPA 70 and 72
- Types of fire alarm systems (including electrical requirements, initiating devices, control functions, alarm indicating appliance, power requirements, signaling services, and automatic detectors in use)
- Names, functions, and requirements of the types of fire alarm systems (including cabling requirements, initiating devices, control functions, alarm notification appliance, type of power required, signaling services, and automatic detectors in use)
- Names and functions of the types of fire alarm signaling systems
- Types of mounting devices and fasteners, and their applications
- Listing requirements and limitations
- Information obtained from contract documents
- Information obtained from the project schedule
- Coordinate installation requirements with the project supervisor.

- Read and interpret manufacturers' literature.
- Determine conduit, raceway, and conductor requirements in accordance with project specifications, installation documents, and standards.
- Connect fiber-optic cable.
- Verify the correct cable type, or substitution, for the application.
- Use standard plans and specifications of jobs to identify dimensions, type of materials, elevations, and locations.
- Oversee the mounting of devices and appropriate fasteners to mount control panels and other system components.
- Install manual fire alarm boxes, automatic fire detection devices, audible signaling appliances, visible signaling appliances, control components, and annunciators.
- Perform functional terminations at the control panel for electrical, initiation, and NAC circuits, and for telephone wiring in order to connect components.
- Use bar-code readers, dip switches, rotary switches, and configuration IR tools to address field devices.
- Apply firestopping practices.
- NFPA 72 & IBC Provisions
- Firestopping requirements, principles, and techniques for various applications such as fire doors, fire walls, partitions, etc. and for each penetration size and type
- Read and interpret manufacturers' published and NRTL-listed installation instructions and testing procedures.
- Apply firestopping for all fire alarm related penetrations of fire rated construction.
- Provide required documentation of firestopping installation, including sign off and AHJ approval.
- Communicate about firestopping requirements with project supervisor.

NICET – Level 2 for Water Based Suppression Systems

- Perform visual inspection of installed sprinklers for damage and visually apparent operational deficiencies or impairments, and verify presence of an adequate supply of spare sprinklers.
- NFPA 25: 5.2.1, 5.2.1.3, 5.4.1.4, 5.4.1.5
- Function and appearance of the parts of a sprinkler
- Minimum clearance rules for sprinklers
- Differentiate between markings/paint applied at the factory and those applied after installation.
- Recognize damage and other conditions that affect the operation of a sprinkler.
- Recognize violations of sprinkler clearance rules.
- Determine whether an adequate supply of spare sprinklers has been provided.
- Inspect fire pumps and fire pump system components for damage and visually apparent operational deficiencies or impairments.
- NFPA 25: 8.2 and Table A.8.2.2
- Function and appearance of the major parts of each type of fire pump system
- Determine inspection frequencies by referring to NFPA 25: Table 8.1.1.2.
- Verify that the scope of an inspection can be fulfilled in conformance with NFPA 25: 8.2.
- Inspect pump houses for conditions that could affect proper operation of the enclosed fire pump.
- Inspect a pump system for indications of conditions that could affect its proper functioning.
- Inspect a fire pump electrical system for indications of conditions that could affect the pump's proper functioning.
- Inspect a fire pump diesel system for indications of conditions that could affect the pump's proper functioning.
- 2.1.3 Inspect tanks for water levels, air pressures, or temperatures that are outside of expected ranges.
- Units of measure for temperature
- NFPA 25: 9.2.4.1
- Use NFPA 25: 9.2.1, 9.2.2, 9.2.4, and Table 9.1.1.2 to determine inspection frequencies.
Recognize indicators of the correct fill level and/or desired air pressure for a tank.
- Read thermometers and water level and air pressure gauges.
- Identify visible damage to a thermometer or gauge, or readings that are outside of the expected range.
- 2.1.4 Visually inspect standpipe and hose systems for damage and visually apparent operational deficiencies or impairments.
- Function and appearance of major components of standpipe systems
- NFPA 25: Table 6.1.1.2/"Inspection"
- Scope of NFPA 1962
- Use NFPA 25: Table 6.1.1.2 to determine inspection frequencies.
- Verify that the scope of an inspection can be fulfilled in conformance with NFPA 25: Table 6.1.2, first column (except "Hose").
- Determine whether hose is present and properly stored.
- Identify external deficiencies that limit or threaten the functionality of a standpipe system, except for hoses.
- Use NFPA 25: Table 13.1.1.2 to determine inspection frequencies for standpipe valves.
- Inspect fire mains, including hydrants, post indicator valves (PIVs), exterior hose houses, monitor nozzles, and mainline strainers for damage and apparent operating condition.
- NFPA-25: Chapter 7.2, and 13.3.2

- Determine inspection frequencies from NFPA 25: Table 7.1.1.2.
- Identify hydrant outlets.
- Identify externally visible deficiencies that could limit or threaten the functionality of fire mains.
- Identify externally visible deficiencies that could limit or threaten the functionality of wet barrel or dry barrel hydrants.
- Identify externally visible deficiencies that could limit or threaten the functionality of post indicator valves.
- Identify externally visible deficiencies that could limit or threaten the functionality of hose houses.
- Identify externally visible deficiencies that could limit or threaten the functionality of monitor nozzles.
- Visually inspect the interior of drained and opened pipes for evidence of foreign material.
- NFPA 25: 14.2, 14.3
- Methods for inspecting pipe interiors
- Indicators of the presence of foreign material
- Use NFPA 25: 14.2 and 14.3 to determine inspection frequencies.
- Identify obstructions such as sludge, rocks, coupons, slime, MIC, rust, scale, corrosion, trash, zebra mussels, sediment, etc.
- Visually inspect pipe interiors.
- Visually inspect the interior of opened and drained alarm, dry pipe, deluge, and swing check valves, and strainers for any conditions that might limit proper functioning, and to clean strainers.
- NFPA 25: 13.4.1.2, 13.4.2.1, 13.4.3.1.7, 13.4.4.1.5, and 13.4.4.1.6
- Which preaction, deluge and dry pipe valves need to be opened to be reset
- Internal components of alarm, dry pipe, deluge, and swing check valves and their functioning
- Use NFPA 25: Table 13.1.1.2 to determine inspection frequencies.
- Reset alarm valves, dry pipe valves, and check valves.
- Locate, remove, clean, and replace strainers.
- Recognize damage to components or other indicators of limited functionality
- Identify visible damage or deficiencies that could limit or threaten the functionality of the valve or strainer

Upon the completion of this step, the Fire Protection Engineer should be highly specialized in fire suppression and protection systems that are fundamental in every building.

*Additionally, a Fire Protection Engineer advancing from step three to step four must also meet or exceed the thresholds for advancement established in the **QUANTITATIVE CORE COMPETENCIES**.*

Fire Protection Engineer, Step 5

To move to step four, a Fire Protection Engineer at step four must obtain the following the following credentials issued by National Institute for Certification in Engineering Technology (NICET):

1. **NICET – Level 2 for Fire Alarm Systems**
- AND**
2. **NICET – Level 2 for Water Based Fire Protection Systems Layout**

Secondly, a Fire Protection Engineer at step five must demonstrate a thorough and expansive knowledge pertaining to the fundamentals of water based fire suppression systems and fire alarm systems.

Upon the completion of this step, the Fire Protection Engineer should be exceptionally specialized in fire protection, fire suppression, and fire alarm systems in all buildings and structures and should be able to readily able to review any new or alteration of a system as well as examine critical systems in place to determine their effectiveness.

Additionally, a Fire Protection Engineer advancing from step four to step five must also meet or exceed the thresholds for advancement established in the QUANTITATIVE CORE COMPETENCIES.

Fire Protection Engineer, Step 6

To move to step six, a Fire Protection Engineer at step five must successfully complete the following to move to step six, a Fire Protection Engineer at step five must obtain the following inspection credentials issued by the State of Wisconsin:

- 1. Possess a License as a Registered Designer of Engineering Systems, Designer of Fire Protection Systems, Registered as a Professional Engineer by the State of Wisconsin or Registered as an Architect by the State of Wisconsin.***

Additionally, a Fire Protection Engineer advancing from step five to step six must also meet or exceed the thresholds for advancement established in the QUANTITATIVE CORE COMPETENCIES.